

92 nm in terms of the peak wavelength at room temperature. Then, as the etching process proceeds and the etching surface comes closer to the etching stop layer 19A, which is made of p-type $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$, the wavelength of the detected PL wavelength decreases to about 345 nm, which is shorter than that for the p-type second cladding layer 20. This is greater than the Al composition of Al of the p-type second cladding layer 20, is described above.

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93 For example, in a case where a 4-crystal x-ray diffraction (XRD) apparatus is used, the diffraction angle (2θ) from the orientation (0002) plane, which is detected during an etching process on the p-type second cladding layer 20 made of p-type $\text{Al}_{0.07}\text{Ga}_{0.93}\text{N}$, is about 34.7° . Then, as the etching process proceeds and the etching surface comes closer to the etching stop layer 19A, which is made of p-type $\text{Al}_{0.10}\text{Ga}_{0.90}\text{N}$, the diffraction angle (2θ) is detected to be about 34.8° . This is because the Al composition of the etching layer 19A is greater than the Al composition of Al of the p-type second cladding layer 20, as described above. Incidentally, the diffraction angle from the (0002) plane of GaN in this case is 34.6° .

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94 First, as in the first embodiment, a cap layer 41 made of p-type $\text{Al}_{0.15}\text{Ga}_{0.85}\text{N}$ is grown, as illustrated in FIG. 13, by supplying TMA and TMG as group III materials, an NH_3 gas as a group V material, and a Cp_2Mg gas as a p-type dopant, onto the substrate, while setting the temperature inside the reactor to about 1000°C and using hydrogen as a carrier gas.